

Sławomir Zdziebko

The John Paul II Catholic University of Lublin

A Generalized Nonlinear Affixation Approach to Polish Palatalizations¹

Abstract

The paper offers an autosegmental approach to Polish palatalizations whereby the presence of palatalizing features is the result of the translation of morpho-syntactic features into phonological features. In the first part I present an analysis of the structural change of the relevant palatalizations, which boils down to the account of how floating autosegments are integrated into the underlying structures of the stem-final segments. The second part is preoccupied with how relevant autosegments are inserted into representation: the palatalizing floating features are phonological ‘halves’ of vocabulary items matching the feature sets marking inflectional categories in Polish. The paper finishes with the discussion of the distribution of the endings *i/y* /i~i/ and *e* /ɛ/ as the markers of the Dative and Locative in one of the declension classes in Polish. I show that the approach advocated here fares better at predicting the distribution of the said endings than the better established approach presented in Gussmann (2007).

Keywords

morpho-phonology, palatalization, licensing constraints, Distributed Morphology, Element Theory

Streszczenie

Artykuł przedstawia analizę zmian palatalizacyjnych w języku polskim, według której palatalizacje są wynikiem integracji cech autosegmentalnych ze spółgłoskami kończącymi tematy fleksyjne odpowiednich klas deklinacyjnych. Pierwsza część artykułu jest poświęcona kwestii przebiegu i efektów samej integracji cech. W części drugiej podejmuję kwestię tego, w jaki sposób dane cechy stają się częścią reprezentacji fonologicznych. Postuluję, iż autosegmenty, o których mowa, są fonologicznymi częściami zasad realizujących konkretne kategorie fleksyjne w języku polskim. W ostatniej części artykułu podejmuję kwe-

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stie dystrybucji końcówek *i/y* /i~i/ oraz *e* /ε/ realizujących celownik i miejscownik jednej z omawianych klas. Wykazuję przy tym, iż podejście przedstawione w sekcjach 3 i 4 artykułu przewiduje dystrybucję wspomnianych końcówek bardziej adekwatnie niż standardowe podejście przedstawione przez Gussmanna (2007).

Słowa kluczowe

morfonologia, palatalizacje, morfologia rozproszona, teoria elementów

1. Introduction

Modern linguistic thought has generated a range of approaches to consonant alternations in Polish. The Chomsky and Halle (1968)-style linear rule-driven approaches are found e.g. in Laskowski (1975) and Gussmann (1978, 1980). Rubach (1984) and Szpyra (1989) offer the lexical and cyclic phonology analyses. The multi-dimensional autosegmental representations were employed in Gussmann (1992) and Szpyra (1995). The affix-specific nature of the palatalizations was highlighted in Dressler (1985) and Gussmann (2007): the two approaches which explicitly referred to diacritics as triggers of palatalizations.² More recently, approaches couched within different versions of Optimality Theory can be found in Rubach (2003) and Łubowicz (2007), among others.

Despite some fundamental differences between the above approaches, they share a single important trait: they treat the vast majority of palatalizations as triggered by what they assume to be pieces of phonological vocabulary. To be more precise, the phonological analyses such as Gussmann (1980) or Gussmann (1992) claim that relevant palatalizations are caused by the mere presence or spreading of feature [-back]. The approaches such as Dressler (1985) and Gussmann (2007) that assume affix-specific diacritics to be the triggers of palatalizations, deny their phonological status. Still, the diacritics responsible for palatalizations are marked on the exponents of appropriate morphemes (stems, affixes or both). In sum, the environment of palatalizations is defined with reference to broadly-understood phonological representations.

In this paper I will present an approach by which palatalizations are the effect of the anchoring of pieces of autosegmental representations on relevant stems. The fundamental difference between the current approach and all the approaches enumerated above is that the said autosegments will be shown to be the result of the translation of certain morpho-syntactic features into phonological features. Effectively, palatalizations will be treated as morpho-phonological mutations and analysed according to the framework known as

² See also Spencer (1985) for the account of Polish palatalizations utilizing morpho-lexical rules, Czaplicki (2013) for an approach utilizing non-generative mechanisms such as analogical extension and rich memory representations.

the Generalized Nonlinear Affixation (Trommer 2011; Bermúdez-Otero 2012), which treats apparent cases of non-concatenative morphology as the anchoring of defective, i.e. not independently realizable, autosegmental features.

The important consequence of the approach by which palatalizing agents are the result of the translation of morpho-syntactic information is that the generalizations about palatalizations must be compatible with the generalizations about exponence. In particular, under the assumption that in the course of vocabulary insertion, morpho-syntactic features are rewritten as phonological features (see Bobaljik 2000), the inflectional nodes in the environment of which one observes palatalizations should be realized by default exponents. I will show that this prediction is borne out and that the approach postulated in this paper is empirically more adequate in accounting for the peculiarities of the exponence of certain Polish inflectional categories than the approaches assuming that palatalizations are triggered by inflectional endings.

The outline of the paper is as follows: in section 2 I will discuss the details of the palatalizations that will be analysed in this paper and argue for the opaque nature of Polish palatalizations with respect to their environment. I will start section 3 with a brief introduction of the main assumptions of Generalized Nonlinear Affixation. Section 3.1 will be devoted to the discussion of the representations of Polish consonantal system in Element Theory (Harris 1994; Backley 2011). Section 3.2 will focus on the principles regulating the anchoring or integration of the palatalizing autosegmental features into the representations of the affected stems: the principle of Element Status Switching Enforcement, the Structure Preservation Principle and the Minimal Repair Principle. Section 3.3 will discuss the relevant anchoring processes in detail and will show how the principles mentioned above derive the attested outputs of palatalizations. Section 4.1 contains the short introduction of some facets of the theory of Distributed Morphology. In section 4.2 I focus on the morphological operations of Fusion and Impoverishment, which are relevant for the account of the morpho-phonology of Polish virile declensions. I also discuss the morphological structure of Polish nominals. Section 4.3 will present and discuss the sets of morpho-syntactic features that will be utilized in the analysis. The said analysis will be contained in section 4.4. Section 5 is devoted to the discussion of the exponence of the Dative and Locative of Class VI of Polish nouns. I will show the inadequacy of the approach put forward by Gussmann (2007) whereby the selection of the appropriate exponent is regulated by the phonological representation of the stem-final consonant. I will also show that the current approach predicts the correct distribution of the competing exponents. Section 6 contains the concluding remarks.

2. The opaque nature of Polish palatalizations

The following table summarizes the relevant facts concerning the palatalization changes that I will focus on.

(1) Palatalizations attested in Polish³

	Palatalization type	Exemplary contexts	Examples
a.	I-Anterior Palatalization: /t,d/ → /t̪c,d̪z/ /p,b,f,v,m/ → /p̪i,b̪i,f̪i,v̪i,m̪i/ /s,z/ → /c,z/ /n/ → /ɲ/ /r/ → /ʒ/ /w/ → /ɫ/	– Locative masc./neu./ fem. sg. <i>e</i> /ɛ/; – Vocative masc. sg. <i>e</i> /ɛ/; – Dative fem. sg. <i>e</i> /ɛ/; – Nominative/Vocative virile pl. <i>i/y</i> /i~i/ (nouns and adjectives)	– <i>pira</i> /t/ – <i>pira</i> /t̪c/ <i>e</i> – <i>ska</i> /w/a – <i>ska</i> /ɫ/ <i>e</i> – <i>premie</i> /t/ – <i>premie</i> /ʒ/ <i>y</i> – <i>cho</i> /ɾ/ <i>y</i> – <i>cho</i> /ʒ/ <i>y</i>
b.	J-Palatalization: /t/ → /t̪s/ /d/ → /d̪z/ /t/ → /t̪ʃ/ only after /s/ /d/ → /d̪ʒ/ only after /z/ /s/ → /ʃ/ /z/ → /ʒ/	– deverbal nominaliza- tion in <i>e-ni</i> , /ɛ-ɲ/ – passive participles in <i>on</i> /ɔ-n/ – 1 st person singular and 3 rd person plural pres- ent tense of verbs in <i>i</i> and <i>e</i>	– <i>wier</i> /t/ło – <i>wier</i> /t̪s/enie – <i>wier</i> /t̪s/ony – <i>ogła</i> /d/a – <i>gła</i> /d̪z/ę – <i>pu</i> /st/ka – <i>opu</i> /ʃt̪/am – <i>ja</i> /zd/a – <i>je</i> /ʒd̪z/ę – <i>dono</i> /s/ – <i>no</i> /ʃ/enie – <i>no</i> /ʃ/ony – <i>wó</i> /z/ – <i>wo</i> /ʒ/q
c.	2 nd Velar Palatalization: /k/ → /k̪s/ /g/ → /g̪z/ /x/ → /ʃ/	– Nominative/Vocative virile pl. <i>i/y</i> /i~i/ (nouns and adjectives); – Dative/Locative fem. sg. <i>e</i> /ɛ/	– <i>Pola</i> /k/ – <i>Pola</i> /t̪s/ <i>y</i> – <i>szpie</i> /g/ – <i>szpie</i> /d̪z/ <i>y</i> – <i>mu</i> /x/a – <i>mu</i> /ʃ/ <i>e</i> – <i>su</i> /x/ <i>y</i> – <i>su</i> /c/ <i>i</i> – <i>su</i> /ʃ/ → <i>suci</i> /
d.	1 st Velar Palatalization: /k/ → /k̪j/ /g/ → /ʒ/ /g/ → /d̪ʒ/ only after /z/ /x/ → /ʃ/	– demonyms in <i>an</i> /an/ – zero-derived de-nomi- nal adjectives – diminutives in (e) <i>k</i> / (ɛ) <i>k</i> /	– <i>Sano</i> /k/ – <i>sano</i> /t̪j/anin – <i>Bó</i> /g/ – <i>bo</i> /ʒ/ <i>y</i> – <i>mni</i> /x/ – <i>mni</i> /ʃ/ek – <i>mó</i> /zg/ – <i>mó</i> /ʒd̪ʒ/ek

³ Glosses to examples ('non-palatalized' – 'palatalized form(s)'): 'pirate, nom. sg.' – 'loc/voc. sg.'; 'rock, nom. sg. fem.' – 'dat/loc. sg. fem.'; 'Prime Minister, nom. sg.' – 'nom/voc, pl.'; 'sick, nom/voc, sg.' – 'nom/voc, pl.'; 'drill, nom/voc, sg. neu.' – 'drilling, nom, sg. neu.' – 'drilled, nom, sg.'; 'politeness, nom, sg. fem.' – 'I smoothe'; 'void, nom, sg. fem.' – 'I leave'; 'a ride, nom, sg. fem.' – 'I ride'; 'denunciation, nom, sg.' – 'carrying, nom, sg. neu.' – 'carried, nom, sg.'; 'cart, nom, sg.' – 'they carry'; 'Pole, nom, sg.' – 'nom/voc, pl.'; 'spy, nom, sg.' – 'nom/voc, pl.'; 'fly, nom, sg. fem.' – 'dat/loc, sg. fem.'; 'dry, nom, sg.' – 'nom/voc, pl.'; 'place name, nom, sg.' – 'inhabitant of Sanok nom, sg.'; 'god, nom, sg.' – 'of god, nom/voc, sg.'; 'monk, nom, sg.' – 'dim, nom, sg.'; 'brain, nom, sg.' – 'dim, nom, sg.'; 'monk, nom, sg.' – 'nom/voc, pl.'; 'more stupid, nom/voc, sg.' – 'nom/voc, pl.'; 'deaf, nom/voc, sg.' – 'nom/voc, pl.'; 'big, nom/voc, sg.' – 'nom/voc, pl.'; 'full, nom, sg.' – 'voc, sg.'; 'priest, nom/voc, sg.' – 'of priest, nom/voc. sg.'; 'money, nom, sg.' – 'dim, nom, sg.'

e.	Spirant Palatalization: /ʃ/ → /ç/ /ʒ/ → /ʒ/	– Nominative/Vocative virile pl. <i>i/y</i> /i~i/ (nouns and adjectives)	– <i>mni/x/</i> – <i>mni/ç/i</i> /miʃ/ → /mici/ – <i>głup/ʃ/y</i> – <i>głup/ç/i</i> – <i>głu/x/y</i> – <i>głu/ç/i</i> /gwuʃ/ → /gwuci/ – <i>du/ʒ/y</i> – <i>du/ʒ/i</i>
f.	Affricate Palatalization: /t͡s/ → /t͡ʃ/ /d͡z/ → /ʒ/	– Vocative sg. masc. (in (<i>e</i>) <i>c</i> /(<i>ε</i>) <i>t͡s</i> / nominal head) – zero-derived denominal adjectives – diminutives in (<i>e</i>) <i>k</i> /(<i>ε</i>) <i>k</i> /, <i>i/yk</i> /i~ik/	– <i>głupie/t͡s/</i> – <i>głup/t͡ʃ/e</i> – <i>ksią/d͡z/</i> – <i>księ/ʒ/y</i> – <i>pienią/d͡z/</i> – <i>pienią/ʒ/ek</i>

The changes presented in part (a) of the table are collectively referred to as I-Anterior Palatalization (see Gussmann 1978, 1980; Rubach 1984; Szpyra 1989 among many others). In those classic generative accounts the class of segments affected by this particular change is marked by feature value [+anterior] distinguishing labials and dentals from other Polish consonants. In section 3 I provide an alternative analysis of the process in which the feature [anterior] does not play a role.

Part (b) of the table illustrates the process known as J-Palatalization, also known as Iotation (see Gussmann 1980, Rubach 1984). It affects the dental stops and fricatives, the former being turned into dental affricates, the latter to alveolar spirants. If the dental plosives are preceded by homorganic fricatives, the outputs are alveolar. J-Palatalization is almost exclusively observed in the verbal system of Polish applying in transposed verbs Secondary Imperfectives and the 1st person singular and 3rd person plural of verbs in *-i-*, and the present tense paradigm of the verbs in *-e-*.

The 2nd Velar Palatalization, depicted in part (c) of the table turns velar plosives into dental affricates. The velar fricative /x/ becomes the alveolar spirant /ʃ/.

Part (d) of the table presents the change known as the 1st Velar Palatalization. According to the 1st Velar Palatalization, the voiceless velar fricative /x/ becomes the alveolar spirant /ʃ/ (as in the case of the 2nd Velar Palatalization). The plosive /k/ becomes alveolar /t͡ʃ/. However, the voiced plosive /g/ turns into the voiced alveolar spirant /ʒ/ in the vast majority of contexts. In fact, the expected output /d͡ʒ/ is attested only if the underlying /g/ is preceded by a dental spirant /z/ as in the example *mó/zg/* – *mó/ʒd͡ʒ/ek* ‘brain, nom, sg. – dim, nom, sg’, with the spirant and the affricate sharing the place of articulation.

The usual way of accounting for the differences in the output of the 1st Velar Palatalization as applying to /k/ and /g/ was to assume that both those segments are turned into affricates with a subsequent rule that spirantizes /d͡ʒ/ to /ʒ/ after sonorants. This type of analysis was employed e.g. by Rubach (1984: 110–119). I present Rubach’s formulation of the rules below.

(2) 1st Velar Palatalization and Spirantization according to Rubach (1984)

- (a) $\begin{bmatrix} +\text{obstr} \\ -\text{coron} \\ +\text{high} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{high} \\ +\text{coron} \\ +\text{strid} \end{bmatrix} / __ [-\text{cons}, -\text{back}]$
- (b) $\begin{bmatrix} +\text{strid} \\ +\text{voiced} \\ -\text{anter} \\ -\text{high} \end{bmatrix} \rightarrow [+ \text{contin}] / [+ \text{sonor}] __$

Although the analysis of the 1st Velar Palatalization put forward by Rubach describes the facts adequately, it is rather *ad hoc* in that there is no general process of postsonorant spirantization in Polish. As a consequence, rule (3b) applies only to one segment, i.e. / \widehat{d}_3 / and only if this segment is itself derived.

Part (e) of the table contains the examples of Spirant Palatalization. Spirant Palatalization is a relatively young and semi-productive process attested in Polish only in the Nominative and Vocative of masculine-personal nouns and adjectives. The half of it involving the voiced spirants appears to be especially susceptible to certain extragrammatical conditioning and is not recognised by prescriptive literature (for details see Baudouin de Courtenay 1908; Zdziebko to appear).

Affricate Palatalization, presented in part (f) of the table, involves the change of the dental affricate / \widehat{ts} / into the alveolar affricate / \widehat{tj} /. However, in the same set of contexts the voiced dental affricate, / \widehat{dz} / is, against expectations, turned into / \widehat{z} /.

It can be observed that the Affricate Palatalization and the 1st Velar Palatalization seem to systematically avoid the voiced alveolar affricate / \widehat{d}_3 / as their output and instead favour the fricative / \widehat{z} /.⁴ In section 3 I will present a novel analysis of the structural changes of palatalization rules. Before this is done, let us have a closer look at the contexts in which palatalizations take place.

As has been mentioned in the introduction, the phonological approaches to palatalizations in Polish postulate that the majority of the changes are triggered by the front vowels that happen to follow the consonants undergoing the alternation. This is explicitly postulated by Gussmann (1978, 1980), Rubach (1984) and Szpyra (1989, 1995), among many others. However, the rule is opaque in the sense of Kiparsky (1973) since a panoply of surface forms ex-

⁴ Some analyses replace the Affricate Palatalization with the 1st Velar Palatalization by postulating that the stems that seemingly undergo Affricate Palatalization terminate in velars (see e.g. Gussmann 2007: 147). This line of reasoning will not be pursued here as, in my opinion, the philosophy by which A is underlyingly B because they both become C in similar contexts typically causes more problems than it solves. In the relevant case, the fact that the stems that show Affricate Palatalization surface with dental affricates in the majority of their paradigms calls for postulating a completely arbitrary and stem-specific application of the 2nd Velar Palatalization in the contexts where the 1st Velar Palatalization does not apply.

ists in which palatalizable consonants precede front vowels. The examples are presented in (3).

(3) The set of front-vowel contexts in which all/some palatalizations are not observed:

Contexts	Examples	Glosses
Word internal contexts (underived)	<i>teraz</i> /teraz/, <i>kreska</i> /kreska/, <i>łez</i> /wez/, <i>gest</i> /gest/, <i>nerw</i> /nerv/ etc.	'now'; 'line, nom, sg, fem'; 'tears, gen, pl'; 'gesture, nom, sg'; 'nerve, nom, sg.'
Instrumental sg. masc./ neu. <i>em</i> /em/	<i>premie</i> /r/em, <i>tema</i> /t/em, <i>listono</i> /ʃ/em, <i>kol</i> /ts/em, <i>mle</i> /c/em etc.	'Prime Minister'; 'subject'; 'postman, 'thorn'; 'milk, neu.'
Nominative/Vocative pl. nonvirile <i>e</i> /ɛ/ (adjectives)	<i>szyb</i> /ʃ/e, <i>gru</i> /b/e, <i>czys</i> /t/e, <i>głębo</i> /c/e, <i>du</i> /ʒ/e	'faster', 'fatter', 'clean', 'deep', 'big'
Accusative sg. fem. <i>ę</i> /ɛw̃/	<i>brzo</i> /z/ę, <i>ra</i> /m/ę, <i>mą</i> /k/ę, <i>ra</i> /ts/ę	'birch'; 'frame'; 'flour'; 'flair'
Genitive/Accusative masculine-animate <i>ego</i> /ɛgɔ/ (adjectives)	<i>mą</i> d/r/ego, <i>śla</i> /b/ego, <i>ślyn</i> /n/ego, <i>lep</i> /ʃ/ego	'clever', 'weak', 'famous', 'better'
Genitive/Dative/Locative sg, fem. (adjectives) <i>ej</i> /ɛj/	<i>mą</i> d/r/ej, <i>śla</i> /b/ej, <i>ślyn</i> /n/ej, <i>lep</i> /ʃ/ej etc.	'clever', 'weak', 'famous', 'better'
Dative masc./neutral (adjectives) <i>emu</i> /ɛmu/	<i>szyb</i> /ʃ/emu, <i>gru</i> /b/emu, <i>czys</i> /t/emu, <i>głębo</i> /c/emu, <i>świe</i> ʒ/emu etc.	'faster', 'fatter', 'clean', 'deep', 'fresh'
Expressive/Diminutive (<i>e</i>) <i>k</i> /(ɛ) <i>k</i> /	<i>pło</i> /t/ek, <i>głó</i> /v/ek, <i>ru</i> /r/ek, <i>kube</i> /w/ek etc.	'fence, nom, sg'; 'head, gen, pl, fem'; 'pipe, gen, pl, fem'; 'bucket, nom, sg.'

What is more, palatalized consonants are regularly attested before non-front vowels both underlyingly and as a result of palatalization processes. The table in (4) contains the examples of non-front-vowel contexts in which palatalized consonants are attested.

(4)

Contexts	Example	Glosses
Word internal contexts (underived)	/t͡ɕa/sny, /ʒɔ/na, /t͡ʃu/ję, /vɔ/sna, v/ɔ/ł etc.	'tight, nom/voc, sg'; 'wife, nom, sg, fem'; 'I feel', 'spring, nom, sg, fem'; 'he took'
Denominal zeroderived feminine adjectives (Nom/ Voc. <i>a</i> /a/, Acc. <i>ę</i> /ɛw̃/)	<i>ko</i> /t͡ɕ/a, <i>wampi</i> /ʒ/q (by I-Anterior), <i>mu</i> /ʃ/q, <i>kru</i> /t͡ʃ/a (by 1 st Velar)	'of cat, nom/voc, sg'; 'of vampire, acc, sg'; 'of fly, acc, sg'; 'of raven, nom/voc. sg'
Adjectival head <i>ast</i> /ast/	<i>kwia</i> /t͡ɕ/asty, <i>pa</i> /c/asty (by I-Anterior), <i>krza</i> /t͡ʃ/asty (by 1 st Velar), <i>pal</i> /t͡ʃ/asty (by Affricate Palatalization)	'flowerlike, nom, sg'; 'striped, nom, sg'; 'bushy, nom, sg', 'fingerlike, nom, sg.'
Adjectival head <i>an</i> /an/	<i>dru</i> /t͡ɕ/any (by I-Anterior), <i>ziemia</i> /t͡ʃ/any, <i>bla</i> /ʃ/any (by 1 st Velar)	'made of wire, nom, sg'; 'made of potato, nom, sg'; 'made of tin, nom, sg.'

Contexts	Example	Glosses
Nominal head <i>an</i> /an/ (demonyms)	<i>sano</i> /t̪/ <i>anin</i> , <i>nowotar</i> /z/ <i>anin</i> (by 1 st Ve- lar), <i>krako</i> /v̥/ <i>anin</i> , <i>szczeci</i> /p/ <i>anin</i> (by I-Ante- rior)	'the inhabitant of Sanok'; 'the inhabitant of Nowy Targ'; 'the inhabitant of Krakow'; 'the inhabitant of Szczecin'
Expressive <i>och</i> /ɔx/	<i>thu</i> /t̪/ <i>och</i> , <i>ś/p̪</i> <i>och</i> , <i>czy</i> /t̪/ <i>och</i> (by I-Anterior)	'fatso, nom, sg.'; 'sleeper, nom, sg.'; 'stickler for clean- ness, nom, sg.'
Expressive <i>uch</i> /ux/	<i>upa</i> /t̪/ <i>uch</i> , <i>ple</i> /t̪/ <i>uch</i> , <i>ospa</i> /l/ <i>uch</i> (by I-Anterior)	'stubborn person, nom, sg.'; 'tattler, nom, sg.'; 'drowsy- head, nom, sg.'
Expressive head <i>us</i> /uc/ (adjectives)	<i>pię</i> /p/ <i>usi</i> , <i>mł</i> /d̪z/ <i>usi</i> , <i>ma</i> /l/ <i>usi</i> (by I-Anterior), <i>dłu</i> /z/ <i>usi</i> (by 1 st Velar)	'pretty, nom, sg, expr.'; 'young, nom, sg, expr.'; 'small, nom, sg, expr.'; 'long, nom, sg, expr.'
Adjectival head <i>n</i> /n/	<i>ro</i> /t̪/ <i>ny</i> , <i>wa</i> /z/ <i>ny</i> , <i>stra</i> /s/ <i>ny</i> (by 1 st Velar), <i>pienie</i> /z/ <i>ny</i> (by Affricate Palatalization)	'yearly, nom, sg.'; 'important, nom, sg.'; 'scary, nom, sg.'; 'related to money, nom, sg.'
Nominal <i>nik</i> /ɲik/	<i>uli</i> /t̪/ <i>nik</i> (by Affricate Pa- latalization), <i>grze</i> /s/ <i>nik</i> (by 1 st Velar), <i>prze</i> /z/ <i>nik</i> (by I-Anterior)	'gamin, nom, sg.'; 'sinner, nom, sg.'; 'transmitter, nom, sg.'
Nominal <i>arz</i> /aʒ/	<i>mle</i> /t̪/ <i>arz</i> (by 1 st Velar), <i>nar</i> /t̪/ <i>arz</i> , <i>ka</i> /c/ <i>arz</i> , (by I-Anterior)	'milkman, nom, sg.'; 'skier, nom, sg.'; 'safebreaker, nom, sg.'

The fact that Polish palatalizations are opaque with respect to the environment in which they take place has been so pervasive a feature of the alternations under consideration that it is possible to provide a typology of the analyses of palatalizations based on how they approach the problem of the environment. Here let me only mention that the majority of approaches postulate the existence of abstract front or back vowels which are, accordingly, deleted having triggered palatalizations or fronted after palatalizations applied (see Gussmann 1978; Rubach 1984 among others). The morpho-phonological approaches such as Dressler (1985) and Gussmann (2007), which argue against the phonological status of palatalizations, account for the observed opacity by assuming that palatalizations are triggered by diacritics marked on the relevant exponents.

None of the above approaches will be followed in this article. Intuitively, the accounts whereby palatalizations are triggered by diacritics or front segments that never surface are not much different from each other as they both bear a whiff of arbitrariness. Still, 'arbitrariness', being one of the most underdefined concepts in linguistics, is not a decisive argument against an analysis or approach. A much more convincing argument against a particular approach is an

alternative approach that is empirically more interesting by covering a bigger set of data and, most importantly, making predictions about the sets of data that the ‘arbitrary’ approach does not make.

The following sections are aimed at providing this kind of an empirically contentful approach to Polish palatalizations. By assuming that the context for palatalization is defined by reference to morpho-syntactic representations, one is forced to take a concrete position concerning the nature of those representations and the interaction between morphology and phonology. Precisely, particular claims must be made when it comes to the phonological realization of morpho-syntactic categories. The analysis of palatalizations quoted throughout this section did not make any such claims.⁵ Whereas the predictions about the exponence made by the current approach will be highlighted in sections 4 and 5, the following section focuses on the structural changes accompanying palatalizations.

3. Generalized Nonlinear Affixation and Polish palatalizations

The underlying assumption of Generalized Nonlinear Affixation (Trommer 2008, 2011; Bermúdez-Otero 2012; Bye and Svenonius 2012; Zimmermann 2013) is that all morphology is concatenative. The apparent cases in favour of non-concatenative and processes morphology approaches are typically effectively reanalysed as involving concatenation of two or more morphemes (see Bye and Svenonius 2012). The idea that non-concatenative processes may be reanalysed as concatenative ones goes back to Lieber (1987, 1992) and is particularly fruitfully employed in the analysis of morpho-phonological consonant mutations. The works of Wolf (2005), Trommer (2008, 2011) and Zimmermann (2013), among many others, show that in the cases of morpho-phonological segmental mutations one in fact has to do with a translation of the pieces of morpho-phonological vocabulary into phonological autosegments which anchor onto the stems overwriting their underlying properties. In all the analyses mentioned above the output of anchoring is derived by means of independently motivated OT constraint rankings, although the Generalized Nonlinear Affixation is independent of the phonological framework one assumes.

The aim of this section is to propose a Generalized Nonlinear Affixation analysis of Polish palatalizations. The focus is on the anchoring or integration

⁵ That is not to say that the studies concerning the interaction of Polish morphology and phonology are lacking. See Rubach (1984), Czaykowska-Higgins (1988) and Szpyra (1989) for particular claims as to the interaction of the two components.

of the autosegments involved in palatalizations into the underlying structures of the stems. The discussion of the origin of the relevant autosegments, which boils down to the discussion of the translation of appropriate morpho-syntactic vocabulary into phonological vocabulary, will be postponed till section 4.

3.1. The representation of Polish consonants and the distribution of /d͡ʒ/

The first step in the analysis is to establish the set of segments which undergo palatalizations. The framework assumed for the purposes of this paper is Element Theory.⁶ The elemental representations of Polish consonants are presented below.

(5) Polish consonantal system

/p/ – {U.ʔ.h.H}	/b/ – {U.ʔ.h}	/f/ – {U.h.H}	/v/ – {U.h}	/m/ – {U.ʔ.L}
/pʲ/ – {U.ĭ.ʔ.h.H}	/bʲ/ – {U.ĭ.ʔ.h}	/fʲ/ – {U.ĭ.h.H}	/vʲ/ – {U.ĭ.h}	/mʲ/ – {U.ĭ.ʔ.L}
/t/ – {A.ʔ.h.H}	/d/ – {A.ʔ.h}	/s/ – {A.h.H}	/z/ – {A.h}	/n/ – {A.ʔ.L}
/t͡s/ – {A.ĭ.ʔ.h.H}	/d͡ʒ/ – {A.ĭ.ʔ.h}			
/t͡ʃ/ – {A.ĭ.ʔ.h.H}	/d͡ʒ/ – {A.ĭ.ʔ.h}	/j/ – {A.ĭ.h.H}	/ʒ/ – {A.ĭ.h}	/ŋ/ – {A.ĭ.ʔ.L}
/t͡ʃ/ – {A.ĭ.ʔ.h.H}	/d͡ʒ/ – {A.ĭ.ʔ.h}	/c/ – {A.ĭ.h.H}	/z/ – {A.ĭ.h}	/ɲ/ – {A.ĭ.ʔ.L}
/k/ – {Ø.ʔ.h.H}	/g/ – {Ø.ʔ.h}	/x/ – {Ø.h.H}		/ŋ/ – {Ø.ʔ.L}
/c/ – {ĭ.ʔ.h.H}	/ʒ/ – {ĭ.ʔ.h}	/ɲ/ – {ĭ.h.H}		
/r/ – {A}	/l/ – {U.ĭ}	/w/ – {U}	/j/ – {ĭ}	

Following van der Hulst (to appear) and Hermans and Botma (2014) I assume that it is the fortis, i.e. voiceless, series of obstruents that is universally marked for a laryngeal feature (here element H). In fact Cyran (2014) has shown that the majority of the facts concerning the laryngeal phonology of Polish can be successfully accounted for with either series of obstruents being laryngeally active. Moreover, the phenomenon of Cracow–Poznań sandhi voicing (see Cyran 2014 ch. 3 and references found there) can be explained by a privative framework only if it is the voiceless series which is considered marked.

Polish has three series of coronal affricates: the dental affricates /t͡s/ and /d͡ʒ/, the alveolar or retroflex affricates usually transcribed as /t͡ʃ/ and /d͡ʒ/ and alveo-palatal laminal /t͡ʃ/ and /d͡ʒ/. Following Nasukawa and Backley (2008) and Backley (2011) I will analyze affricates as plosives with complex place

⁶ Due to space restrictions I am not able to present a detailed introduction of Element Theory. The interested reader is referred to works by Harris (1994), Backley (2011), Gussmann (2007) and Cyran (2010). Still, the reader should keep in mind that this paper does not conform strictly to the versions of Element Theory presented in these works. At the same time it must be stated that elements as atomic building blocks of phonological representations are not sine qua non of the analysis advocated here. As has been mentioned above, Generalized Nonlinear Affixation is compatible with virtually any approach to phonological representations or computation. The paper offers an approach to Polish palatalizations utilizing elements as no such exhaustive approach has been proposed so far (but see Michalski 2009: ch. 3 for attempts).

specification. Nasukawa and Backley (2008) point to the fact that the cues for the place of articulation in plosives are much poorer than those in fricatives. This is due to a relatively short burst involved in the production of oral stops. If a given plosive is phonologically heavily marked for the place of articulation, it must involve a prolonged burst that gives the listener the possibility to recover the cues. Thus, the delayed release associated with the pronunciation of affricates is treated by Nasukawa and Backley (2008) as cue enhancement related to the production of a given sound and does not have to be represented phonologically.

The subsystem of Polish continuant obstruents is smaller than the system of non-continuant. Polish has four series of coronal stops, while the inventory of coronal fricatives consists of only three pairs: the dental, alveolar and alveo-palatal fricatives.

As a consequence, the system utilizes all three logically possible combinations of the elements responsible for coronality and palatality, i.e. A and I, to represent the subsystem of coronal affricates. On the other hand, the inventory of coronal fricatives calls for the use of only one type of an asymmetrical relation between A and I, as plain dental fricatives are represented by A alone (see below for a justification of this choice). The asymmetrical relation utilized by the subsystem of Polish fricatives is the one in which element I is the head, element A playing the role of an operator. The relevant representations render the alveo-palatal fricatives /c/ – {A.I.h.H} and /z/ – {A.I.h}. This choice is justified by the fact that only I-headed consonants in Polish may be followed by the close front vowel /i/ represented as {I} (see Gussmann 2007: 44). This is the case for the alveo-palatal spirants but not for the dental and alveolar fricatives. The fact that the A-headed combination of the elements for coronality and palatality is present in the subsystem of non-continuant but absent from the subsystem of continuant will be expressed by means of the following licensing constraint:

(6)

The combination of elements [A.I.h]⁷ must be licensed by a node dominating?
(‘stopness’) element.

A comment is also necessary concerning the voiced alveolar apical affricate /d͡z/, the segment which, as has been pointed out, is systematically avoided as an output of the palatalizations that may potentially derive it. It is claimed to be part of the inventory of Polish by virtually all authors. However, a closer look

⁷ I use of braces ‘{ }’ to express the complete and independently realizable phonological expressions, square brackets ‘[]’ for the parts of phonological expressions which must be integrated into larger segmental structure to be realized. Parentheses ‘()’ are used for the parts of expressions which may be present in the segments affected by relevant rules and constraints, but do not have to be referred to in their structural descriptions.

at this segment reveals that its presence in the Polish language is extremely limited.

/d͡ʒ/ is hardly attested in the native vocabulary.⁸ In fact, unless it alternates with /g/ or /d/, it is found in two roots: <d͡ʒd͡ʒ> /d͡ʒd͡ʒ/ as in *d͡ʒd͡ʒownica* 'earthworm, nom, sg, fem.', *d͡ʒd͡ʒu* 'rain, gen, sg.', *d͡ʒd͡ʒyć* 'to rain' and <dro͡ʒd͡ʒ> /drɔ͡ʒd͡ʒ/ *dro͡ʒd͡ʒe* 'yeast, nom, pl.'

In items such as *mia/ɹd͡ʒ/ɹc* 'to smash'; *mia/ɹd͡ʒ/ek* 'pulp, dim, gen, pl, fem.'; *ró/ɹd͡ʒ/ek* 'stick, dim, gen, pl, fem.'; *mó/ɹd͡ʒ/ek* 'brain, dim, nom, sg.'; *drobia/ɹd͡ʒ/ek* 'trifle, dim, nom, sg.'; *pošli/ɹd͡ʒ/ek* 'skid, dim, nom, sg.'; *drza/ɹd͡ʒ/ek* 'splinter, dim, gen, pl, fem.' /d͡ʒ/ is derived by the 1st Velar Palatalization from /g/ preceded by /z/.

/d͡ʒ/ is also derived from /d/ preceded by /z/ in the contexts where J-Palatalization is observed. This is exemplified by forms such as *je/ɹd͡ʒ/ɛ* 'I ride' related to *ja/zd/a* 'a ride, nom, sg, fem.'; *gnie/ɹd͡ʒ/ɛ* 'I nest' that shares the stem with *gnia/zd/o* 'nest, nom, sg, neu.'; *bru/ɹd͡ʒ/ɛ* 'I contaminate' related to *bru/zd/a* 'furrow, nom, sg, fem.' and *gwi/ɹd͡ʒ/ɛ* 'I whistle' related to *gwi/zd/* 'whistle, nom, sg.'

The important observation concerning the distribution of /d͡ʒ/ in the native Polish vocabulary is that it is found only in clusters, where it is typically preceded by a homorganic spirant. Sequences consisting of a sonorant followed by the voiced alveolar affricate seem illegitimate in Polish. The restriction whereby /d͡ʒ/ occurs only in obstruent clusters and is banned from the position after sonorants seems rather arbitrary and idiosyncratic. Still, it is impressively robust being exceptionless in the native vocabulary. The robustness of the constraint banning /d͡ʒ/ from the position after a sonorant suggests that it is not a mere historical accident but rather a living generalization forming part of the linguistic competence of Polish speakers. Let us formalize the observation concerning the distribution of /d͡ʒ/ as a general licensing constraint working in Polish.

(7)

Given a phonological expression {A.I.?.h}, its portion consisting of A, I and h must be licensed by two adjacent syllabic positions.

What (7) says is basically that /d͡ʒ/ must be part of a partial geminate or a geminate. Since sonorants in Polish do not contain element h, the affricate is banned from the position after a sonorant.

⁸ However, it is amply attested in non-native vocabulary, where it is sometimes spelt as <j>. Words such as *d͡ʒin* 'genie, nom, sg.', *d͡ʒem* 'jam, nom, sg.', *d͡ʒungla* 'jungle, nom, sg, fem.', *Jumbo Jet* 'jumbo jet, nom, sg.'; *rad͡ʒa* 'raja, nom, sg.' and many others are typically understood by foreigners without explicit translation or interpreting.

As I will show below, constraints (6) and (7) play the crucial role in the analysis of Polish palatalizations.

3.2. Element Status Switching, Structure Preservation and Minimal Repairs

This section introduces two constraints whose role is to derive the attested outputs of the anchoring of the palatalizing autosegments. These are Element Status Switching Enforcement (ESSE) and Structure Preservation Principle. Additionally, an approach to phonological repair operations is formulated as the Minimal Repair Principle. The first of the relevant principles is presented in (8).

(8) Element Status Switching Enforcement

- (a) If an element E-head is added to an expression containing E-operator, the result is E-head.

$$E_i + \underline{E}_i = \underline{E}_i$$

- (b) If an element E-operator is added to an expression containing E-head, the result is E-operator.

$$\underline{E}_i + E_i = E_i$$

ESSE makes sure that an element present in the underlying representation of a segments will change its status if the relevant segment is augmented with the same element with a different headedness status. The implicit assumption is that if an expression containing E is augmented with another instantiation of E, the two E(lements) conflate. By manipulating the headedness status of elements, ESSE makes sure that the translated morpho-syntactic information is signaled phonologically.

The second principle that regulates the output of anchoring, i.e. Structure Preservation, has been adopted from the literature on Lexical Phonology and Morphology (Kiparsky 1982; Borowsky 1990; McMahon 2000). Consider the formulation presented by Borowsky (1990: 29).

(9) Structure Preservation:

Lexical rules may not mark features which are non-distinctive, nor create structures which do not conform to the basic prosodic templates of the language.

Since the framework I assume does not recognize the existence of the generative lexicon, no appeal to lexical rules can be made. Instead I will adopt a modified version of the principle, which refers to the mechanism of licensing constraints (see Charette and Göksel 1994; Kaye 2001).

(10) Structure Preservation (adopted version)

Phonological derivation may not create phonological expressions or configurations which violate the general licensing constraints of a language.

Structure Preservation (SP) says that the output of phonological computation must not contain structures which violate licensing constraints active in a given language. Importantly, however, it does not preclude temporary violations of licensing constraints. If the expression arrived at through the anchoring of palatalizing autosegments violates one of the constraints, the grammar induces non-ordered repair operations that derive grammatical outputs. For the theory of repair operations to wield reasonable empirical power, the repairs must be kept minimal. To ensure that, let me propose the Minimal Repair Principle presented in (11).

(11) Minimal Repair Principle

- (a) repairs must not delink the newly integrated elements
- (b) one repair operation may change only one property of a segment (delink one element or one node, change the headedness status of exactly one element)
- (c) a repair must not create a structure that violates the licensing constraints of a language.

The protection of the newly integrated structure mentioned in (11a) is in fact a consequence of a more general morpho-phonological principle formulated in van Oostendorp (2005) as *REALIZE MORPHEME*. The exact formulation of *REALIZE MORPHEME* is presented in (12).

(12) *REALIZE MORPHEME* constraint

For every morpheme in the input, some phonological element should be present in the output.

Here I adopt the interpretation of *REALIZE MORPHEME* made explicit in Trommer (2008: 174). Trommer claims that *REALIZE MORPHEME* is a constraint referring to vocabulary items rather than to syntactic heads. In this sense it makes sure that the floating material, which is in fact the translated morpho-syntactic features, is realized phonologically but does not preclude the existence of zero inflection.

Both (11b) and (11c) may be seen as the consequence of the assumption shared by a number of scholars (e.g., Calabrese 2000: 75–76; see also Harris 1994: 127) that repairs should involve as few operations as possible. This requirement is formulated in autosegmental terms in (11b). (11c) makes sure that each repair operation leads to the optimization of a representation by removing the violation of the relevant licensing constraint. On the assumption that all licensing constraints are of equal status, the optimization does not take place if the application of a repair leads to one licensing constraint being respected at the cost of the violation of another licensing constraint.

A possible question one might ask at this point is why licensing constraints should be violated in the first place and if the violations do not point to certain constraints entertaining a different status than others. As will become clear in the following section, it is the particular mode of the integration of palatalizing

autosegments forced by REALIZE MORPHEME and ESSE that leads to the violation of relevant licensing constraints. If so, is it not the case that the two principles are in some sense more strictly respected than licensing constraints? Why cannot licensing constraints simply block the processes which lead to their violations?⁹

The underlying assumption behind the analysis presented in this article is that the phonological derivations are complete when all possible processes (rules) within a given domain have applied and when all constraints and principles are satisfied.

It may sometimes be the case that certain constraints are temporarily violated for the sake of satisfying different constraints. The difference in the status of constraints stems not from their position in the ranking or their weight but rather from the structural changes necessary for their satisfaction. For instance, REALIZE MORPHEME may be satisfied only by integrating the autosegments realizing relevant morpho-syntactic information into the underlying structure of stems.¹⁰ On the other hand, constraints (6) and (7), which define the conditions necessary for certain combinations of autosegments to be licensed, may be satisfied in a variety of ways. The repair operations employed by the grammar to satisfy licensing constraints such as (6) and (7) above are kept in check only by the Minimal Repair Principle.

As a matter of fact, the temporary violations of licensing constraints are an expected (though indirect) consequence of the modular architecture of the Human Language Faculty. Under a different model of Human Language Faculty it is conceivable that the phonological exponents of morpho-syntactic categories would be designed in a way that makes sure that, once integrated into the representations, they do not violate the licensing constraints of a given language. For this to be possible the structure of atomic units of lexical representation would have to be sensitive to the phonological principles and constraints. Under the strictly modular architecture assumed in this paper, this is impossible. In fact, if the integration of the phonological representations of morpho-syntactic categories did not involve temporary violations of certain constraints, the modular architecture would be seriously questioned.

⁹ I would like to thank Joe Pater and an anonymous reviewer for making me sensitive to the importance of these questions.

¹⁰ Here I assume a strict interpretation of REALIZE MORPHEME by which all the features must be integrated into the underlying structure. The effect of the integration must result in the output to the integration being different from the input. In fact van Oostendorp's (2005) analysis of Limburg tones pursues a less strict interpretation.

3.3. Deriving Polish palatalizations

Let me begin the analysis with the most general of the changes: I-Anterior Palatalization. Before the exact account can be formulated, it is necessary to point to the important difference between the standard binary feature accounts and the Element Theory account of this process. A potential problem for the latter is the lack of the counterpart of the feature [+/-anterior]. As a matter of fact, within Element Theory labial and coronal segments do not form a natural class defined with reference to a single feature. Consequently, I-Anterior Palatalization cannot be formulated as a rule affecting a class of segments defined in this way.

However, Element Theory postulates an alternative way of grouping segments in natural classes. Phonological expressions may be grouped into natural classes on the basis of the number and type of elements that they are composed of. A quick investigation of the representations found in (5) above will prove that all the segments which undergo I-Anterior Palatalization possess exactly one element defining their place of articulation. In this way they are opposed to velars which are unspecified for place, and palatalized labials and coronal affricates, which possess two elements responsible for place specification. It is this property of Polish labials and dentals that will be referred to in the formulation of I-Anterior Palatalization presented in (13).

(13) I-Anterior Palatalization



Examples:

/p/ - {U.?.h.H} → /p/ - {U.Ī.?.h.H}

/d/ - {A.?.h} → /d̥z/ - {A.Ī.?.h}

/s/ - {A.h.H} → /c/ - {A.Ī.h} etc.

/w/ - {U} → /w/ - {U.Ī}

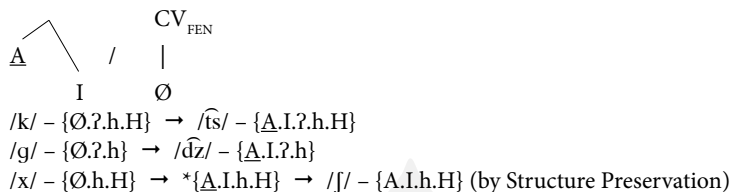
/n/ - {A.?.L} → /ɲ/ - {A.Ī.?.L}

(13) says that a stem-final phonological expression which contains one and only one resonance or place element whose status is that of an operator is augmented with a place node containing an I-element acting as the head and an empty operator subnode.¹¹ Under this formulation, I-Anterior Palatalization derives correct outputs in all cases without recourse to feature value [+anterior].

¹¹ Following Harris (1994: ch. 3) I assume that the subsegmental structure of consonants is different from the subsegmental structure of vowels. Whereas the subsegmental structure of vowels is best represented as a three-dimensional 'bottlebrush', the C nodes dominate a root node under which the place and laryngeal nodes are subsumed. Whether manner elements such as 'noise' (h) or 'stopness' (?) reside on a separate manner node or are linked directly to the root node is orthogonal to the analysis presented in this paper. Importantly, however, the place nodes dominating resonance elements responsible for palatalizations must not be linked to the Final Empty Nuclei (FEN), which do not possess subsegmental representation that could host them.

The second change that will be considered here is the 2nd Velar Palatalization presented in (14).

(14) 2nd Velar Palatalization

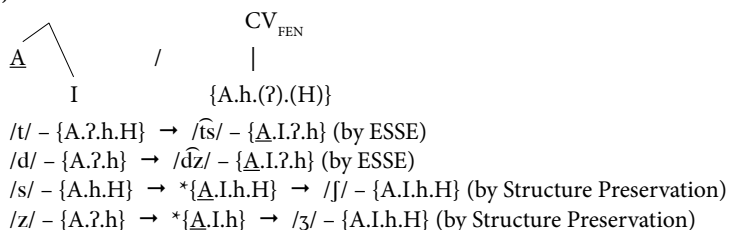


According to (14), the 2nd Velar Palatalization involves the anchoring of an autosegmental place node specified for elements A-head and I-operator to a stem-final segment with no resonance or place elements. The derivation of the dental affricates from velar plosives is straightforward. However, the addition of [PLACE[A.I]] to the representation of the velar fricative creates a representation which is not attested in Polish. As mentioned above Polish has only three series of coronal fricatives. The dental fricatives should be represented as possessing only one place-defining element as they regularly undergo I-Anterior Palatalization. To represent the alveolar and alveo-palatal series, one needs to employ one symmetrical and one asymmetrical combination of elements A and I. Since /c/ and /z/ are followed by the front high vowel /i/, which follows only I-headed segments, it is [A.I] combination that should represent the alveo-palatal resonance. The phonological expression {A.I.h} is spurious, hence ungrammatical. This reasoning underlies the formulation of licensing constraint (6), which bans expressions such as {A.I.h.(H)}.

When such an expression is derived by means of morpho-phonological addition, the Structure Preservation Principle enforces a repair operation by which A-head is demoted to the status of an operator. The resulting representation {A.I.h.H} is rendered as the alveolar fricative /f/.

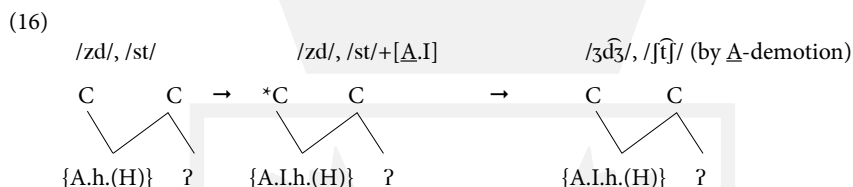
Like the 2nd Velar, J-Palatalization involves the anchoring of [PLACE[A.I]]. However, this time the input is defined as stem-final dental obstruents. The exact formulation is presented in (15).

(15) J-Palatalization



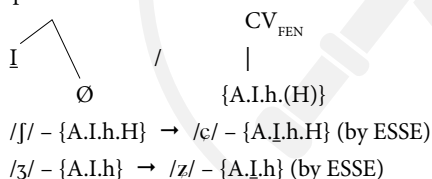
Whereas the correct outputs of J-Palatalizations are derived in a straightforward manner if the inputs are the plosives, the derivation of alveolar fricatives involves the repair strategy that has already been proposed for the derivation of the 2nd Velar Palatalization, i.e. A-demotion.

An additional complication to J-Palatalization is that the final sequences /zd/ and /st/ do not end up as dental but as alveolar. To derive the said sequences, let us assume that /zd/ and /st/ are partial geminates in which {A.h.(H)} are shared by the fricative and the plosive. As the combination of [A.I] is integrated into the representation of the stem, ESSE changes the status of A, which is now the headed A. However, since expressions {A.I.h.(H)} are not licensed in Polish, the by now familiar repair strategy of A-demotion derives the correct output sequences /ʃtʃ/ and /zdʒ/. The details of the relevant derivation are presented in (16).



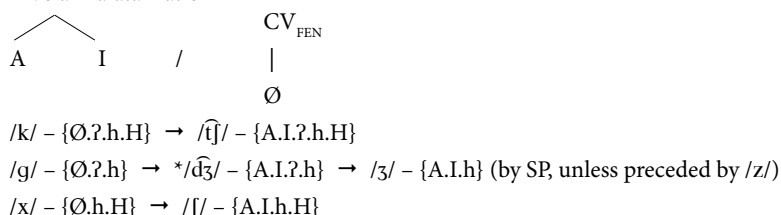
Whereas the 2nd Velar Palatalization is achieved only by the intervention of the Structure Preservation Principle and J-Palatalization involves the working of the two principles, the outputs of Spirant Palatalization are achieved solely by the application of the Element Status Switching Enforcement. The exact formulation of Spirant Palatalization is presented in (17).

(17) Spirant Palatalization



Spirant Palatalization is very restrictive in its application in that it targets only the alveolar fricatives. Hence, its environment is defined most specifically. When I-head is added to the relevant expression, ESSE forces the I-operator and I-head to conflate as a head. The outputs are the alveo-palatal laminal spirants /ç/ and /z/.

The last two changes that will be analysed here are the 1st Velar and Affricate Palatalization presented in (18) and (19), respectively.

(18) 1st Velar Palatalization

The 1st Velar Palatalization is the result of the addition of a symmetrical combination of elements A and I to stems terminating in velars. The change applies in a straightforward manner in the case of the voiceless velar plosive and fricative deriving /tʃ/ and /f/. However, in the case of the voiced velar plosive, the output is /dʒ/. As a matter of fact, whenever /dʒ/ is derived by the 1st Velar Palatalization, it violates licensing constraint (7), which says that the [A.I.h] portion of the affricate must be doubly liked. If the input /g/ is preceded by /z/, the grammar repairs the ill-formed sequence */zdʒ/ by spreading the I-element to the left, thus forming the required partial geminate.

The formation of a partial geminate is not an available option if the input /g/ is preceded by a sonorant. In such cases, the grammar employs another repair operation, i.e. ?-delinking. The result of ?-delinking is the derivation of the /ʒ/ in all the contexts.

Importantly, due to the working of the Minimal Repair Principle presented in (11) above, ?-delinking is the only repair available in the derivation under discussion. The delinking of A or I¹² would violate condition (11a). Since the presence of ‘stopness’ component (?) presupposes the presence of ‘aperiodic energy’ (h) in Polish¹³, the latter must not be delinked without creating an ungrammatical representation, which would violate condition (11c).

No less important is the fact that ?-delinking is not a possible repair in the cases of the illicit */zdʒ/ since Polish phonology does not license stem-internal sequences of fricatives.¹⁴ As a result, ?-delinking would create an illicit cluster */zʒ/, violating condition (11c) of the Minimal Repair Principle.¹⁵

¹² It is probably important to point out that condition (11a) prevents delinking of the augmented elements as well as the superstructure they are subsumed under. Thus, delinking of the place node or the entire segment are also out of the question.

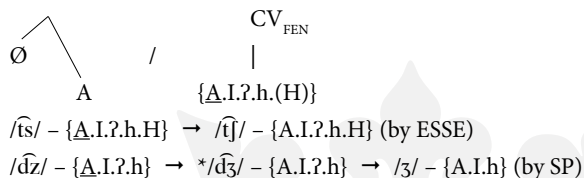
¹³ Polish does not have unreleased stops that would be phonologically active in any sense.

¹⁴ The only exception to this generalization is the root <ss> /ss-/ present in the verb *ssać* ‘to suck’, the noun *ssak* ‘mammal, nom, sg.’ and their derivatives.

¹⁵ One may wonder how ?-delinking is different from the rule of Spirantization postulated e.g. by Rubach (1984). Although the full approach to repair operations still awaits its formulation, the claim made here is that ?-delinking is a strategy that repairs also other illicit configurations involving non-continuant. For instance, the alternations such as *koń* /kɔɲ/ – *koński* /kɔɲsci/ ‘horse, nom, sg. – adj. nom, sg.’ are also due to the working of ?-delinking. Thus, ?-delinking has a wider scope than Spirantization, which, as has been mentioned above, applies only

The last alternation set that will be discussed here is Affricate Palatalization. It is the only change in Polish nominal system whose output is derived by the joint application of the Element Status Switching Enforcement and Structure Preservation. Affricate Palatalization is presented in (19) as an addition of element A-operator to dental affricates.

(19) Affricate Palatalization



The addition of A to the voiceless dental affricate renders a regular output: A is demoted to the status of the operator by ESSE. When the same happens with /dʒ/, the result is /dʒ/. Since /dʒ/ must be part of a cluster, ?-delinking applies deriving /ɟ/.¹⁶

4. The morpho-phonology of Polish masculine-personal declensions

The aim of this section is to present the analysis of the exponence of the masculine-personal or virile nominal declensions. I chose to analyse the declension classes of nouns marked for the masculine-personal gender due the unmatched richness of palatalization processes that apply to them (see below for details). I will start by introducing the assumptions of the theory of Distributed Morphology focusing on those aspects of the theory which are relevant for the analysis of Polish nominals. The core of the analysis, presented in section 4.4 consists of the formulation of the rules of impoverishment and vocabulary items relevant for the realization of the inflectional categories in Polish.

to /dʒ/. Note also that if Polish voiced obstruents were marked with L-element responsible for voicedness, a possible repair would be to delink L, thus deriving /tʃ/. Under the assumption that it is the voiceless series which is marked with an active category no ?-delinking is available.

¹⁶ Unless Affricate Palatalization involves the anchoring of [PLACE[A.I]], which is a possible option, the conceivable repair operation is I-delinking deriving /d/ from the intermediate ill-formed /dʒ/. However, we know that ?-delinking is independently necessary to derive the 1st Velar Palatalization. Since the 1st Velar Palatalization is significantly more frequent than Affricate Palatalization, it is reasonable to assume that a learner acquiring Polish morpho-phonology will first encounter and acquire the 1st Velar Palatalization and, by implication, ?-delinking. Since it is also reasonable to assume that a speaker will not postulate a completely new repair strategy, having already acquired an equally effective one, I-delinking remains only a remote theoretical possibility.

Distributed Morphology (Halle and Marantz 1993; Halle 1997; Bobaljik 2000; Embick and Noyer 2007; Embick 2010, Matushansky and Marantz 2013) is a realizational approach to morphology which assumes that morphological operations work after syntactic derivation and on the same hierarchical structure as syntax.

The output of syntax is assumed to undergo a range of operations such as Morphological Merger (Marantz 1984), Lowering and Local dislocation (Embick and Noyer 2007), Fission (Halle 1997), Fusion and Impoverishment (Halle and Marantz 1993; Halle 1997). The last two will be of particular interest to the analysis presented below.

One of the most important assumptions made in Distributed Morphology and stemming from the general modular architecture of the linguistic faculty assumed by this model is the absence of phonological features in the syntax and morphology. The terminal nodes that undergo syntactic and morphological computation contain only morpho-syntactic or grammatical features. Phonological features are inserted into the hierarchical morphological representation only after all morphological operations have been performed (so called *late insertion*). The stage in the derivation at which phonological properties of nodes are supplied is known as Vocabulary Insertion. The units of the vocabulary are referred to as vocabulary items. A schematic presentation of a vocabulary item is given in (20).

- Vocabulary items are crucially underspecified with respect to terminal nodes into which they are inserted. As a result, it is often the case that more than one vocabulary item matches the features constituting a terminal node. It is assumed, therefore, that Vocabulary Insertion takes place in accordance with what Halle (1997: 428) calls the Subset Principle. The exact procedure of Vocabulary Insertion is summarized in (21).

- (21) The Subset Principle (Halle 1997: 428)
 ‘The phonological exponent of a Vocabulary item is inserted into a morpheme in the terminal string if the item matches all or a subset of the grammatical features specified in the terminal morpheme. Insertion does not take place if the Vocabulary item contains features not present in the morpheme. Where several Vocabulary items meet the conditions for insertion, the item matching the greatest number of features specified in the terminal morpheme must be chosen.’

It is often the case that insertion of a set of phonological features or an exponent that matches a given node is sensitive to the content of the neighboring

nodes. This situation is referred to as *contextual allomorphy*. The most restrictive approach to contextual allomorphy formulated in Bobaljik (2000) assumes that the rules of exponence may only refer to the morpho-syntactic features up the tree and to the phonological features down the tree. This follows from two other general assumptions: the assumptions that Vocabulary Insertion (VI) proceeds in a bottom-up fashion and that the consequence of the insertion of vocabulary results in the *rewriting* of the morpho-syntactic features. According to Bobaljik, VI is an operation that replaces morpho-syntactic features with phonological features so that the grammatical properties of the terminal node that has undergone the insertion are used up and no longer present in the representation. This restrictive approach to VI will be followed in this article. Additionally, I will assume that the reference to the content of the surrounding nodes renders a given vocabulary item better specified than an item with the same specification but without reference to the environment. In short, contextualized items win the competition with contextless items.

4.2. Fusion and Impoverishment in Polish nominals

The morphological representation of a Polish noun is presented in (22).

(22)

[[[$\sqrt{\text{ROOT}}$ <i>n</i>]	<i>Class</i>]	<i>Gen(der)</i>]	<i>#</i>]	<i>Case</i>]
$\begin{bmatrix} +/\alpha \\ +/\beta \\ +/\gamma \\ +/\delta \end{bmatrix}$		$\begin{bmatrix} +/\text{GF1} \\ +/\text{GF2} \\ +/\text{GF3} \end{bmatrix}$	$\begin{bmatrix} +/\text{Pl} \end{bmatrix}$	$\begin{bmatrix} +/\text{F1} \\ +/\text{F2} \\ +/\text{F3} \\ +/\text{F4} \end{bmatrix}$

Class and case features are purely morphological. They are added to the structure post-syntactically and their primary role is to govern the Vocabulary Insertion. Importantly, in no Polish noun do the four nodes receive separate exponents. This is the case due to the working of the operation of Fusion.

Fusion is a morphological operation that conflates two or more morpho-syntactic terminal nodes into one node. The features associated with the new node are the sum of features of the input nodes. The surface effects of Fusion are observed in what is traditionally called fusion languages, in which more than one morpho-syntactic property is realized by one desinence. (24) depicts Fusion operation attested in Polish nouns the result of which is the creation of an *Exp(onence)* node which contains the class, gender, number and case features which may be referred to in course of the Vocabulary Insertion.

(23) Fusion in Polish nouns

$[[[[\sqrt{\text{ROOT}} \text{ } n] \text{ } \textit{Class}] \textit{Gen}] \#] \textit{Case}] \rightarrow [[\sqrt{\text{ROOT}} \text{ } n] \text{ } \textit{Exp(onence)}]$

The second operation that is of great importance for the analysis of the morpho-phonology of Polish virile nouns is Impoverishment. Classified as a type of re-adjustment operation by Halle and Marantz (1993), Impoverishment deletes features from morpho-syntactic nodes or, less often, entire morpho-syntactic nodes. The general schema for Impoverishment rules in Polish is presented in (24).

(24) Impoverishment in Polish nouns

$$[+/-F_1] \rightarrow / n \widehat{[(+/-F_2, +/-F_3, \dots, +/-F_n) \text{ — }]}$$

The rule presented above says that a given feature is deleted when it c-commands a nominal head. Some Impoverishment generalizations may be sensitive to the presence of other features associated with the same node as the deleted features.

In section 4.4 I will introduce two Impoverishment rules that affect case and # features in Polish masculine-personal nouns. The nature of these features lies at the heart of the unified analysis of palatalizations and the exponence in Polish virile declensions. It is the aim of the following section to present to the reader the idea of category decomposition and justify the choice of particular case, gender and class features utilized in the present analysis.

4.3. Category decomposition in Polish

The underlying idea behind case decomposition is that case categories such as Nominative or Locative are not atomic entities but are themselves composed of more basic units. Since the times of the seminal studies on case (Hjelmslev 1935; Jakobson 1936) the case decomposition has gained many supporters and generated vast literature. Thus the decomposition of morphological case categories has been proposed for German by Bierwisch (1967) and McFadden (2006, 2007), Russian by Jakobson (1936), Chvany (1986), Neidle (1988) and Franks (1995), for Latin by Halle (1997), for Armenian by Halle and Vaux (1997) and for Polish by Gunkel (2003), among many others.

The definitions of decomposed case features that will be used in present analysis are given in (25).

(25) Definitions of case features:

- (a) OBLIQUE: [−OBL(IQUE)] cases are assigned structurally to nominals in the positions introduced by verbs (v+VoiceP complex).
- (b) OBJECTIVE: [+OBJ(ECTIVE)] cases are assigned structurally or inherently to nominals which are internal arguments of verbs.
- (c) SUBJECTIVE: [+SUB(JECTIVE)] cases are assigned to external arguments
- (d) PREDICATIVE: [+PRED(ICATIVE)] cases are assigned in object-controlled secondary predicates

The cases checked structurally in the *v*+VoiceP complex are the Nominative, Accusative, Genitive (of Negation) and Dative. The three [+OBL] cases in Polish: the Locative, the Instrumental and the Vocative, are never checked structurally in the positions introduced by *v*'s.

The definition in (26b) subsumes all nominals which play a role of verbal complements in Polish. Apart from the cases of the Accusative and the Genitive of Negation, this includes the Genitive assigned inherently by some verbs (e.g. *unikać* 'avoid'). Polish also has verbs assigning the Dative (e.g. *ufać* 'trust') and the Instrumental (e.g. *zarządzać* 'govern') to their complements. Complements of verbs in Polish never carry the Nominative, the Locative or the Vocative, hence, these cases are specified as [−OBJ].

Apart from the Nominative the other [+SUB] cases in Polish are the Genitive and the Vocative. Genitives may be assigned to nominals in the role of subjects in transpositional constructions such as *śpiewanie hymnu Edyty* 'Edyta's singing of the anthem' where *Edyta* 'name, gen, sg, fem.' is the subject of 'singing'. The Vocative is marked on the subjects of imperatives.

The three cases that can be found in object-controlled secondary predicates in Polish are the Accusative, the Genitive (of Negation) and the Instrumental. The table in (26) summarizes case decomposition in Polish:

(26) Case decomposition in Polish

	OBLIQUE	OBJECTIVE	SUBJECTIVE	PREDICATIVE
Nominative	−	−	+	−
Genitive	−	+	+	+
Dative	−	+	−	−
Accusative	−	+	−	+
Locative	+	−	−	−
Instrumental	+	+	−	+
Vocative	+	−	+	−

I assume Polish nouns to be divided into five gender-animacy classes. The basis for the division is the declension of adjectives and pronouns modifying nouns in each class.¹⁷ The following table illustrates the analysis of gender-animacy classes into three distinctive Gender Features.

(27)

	GF1	GF2	GF3
MASCULINE-PERSONAL	+	−	−
MASCULINE-ANIMATE	+	+	−

¹⁷ The details of the Polish gender system are discussed e.g. in Mańczak 1956, who was the first to propose the five-gender system, Corbett 1983; Laskowski 1998: 207–214; Przepiórkowski 2003 and Nagórko 2007: 108–111.

MASCULINE-INANIMATE	+	+	+
FEMININE	–	+	–
NEUTER	–	+	+

The nouns marked as [+GF1] share a number of morpho-phonological properties. Only those nouns can have *i/yk* /i~ik/ as the exponent of the diminutive. They also do not show /ɔ/-raising before the multifunctional marker (*e*)*k* /(*ε*)*k*/, so that *bożek* /bɔʒɛk/ ‘idol, nom, sg’, *wołek* /vɔwɛk/ ‘ox, dim. nom,sg.’ and *worek* /vɔrɛk/ ‘sack, dim. nom, sg.’ derived from *Bóg* /bug/ ‘god, nom, sg’, *wół* /vuw/ ‘ox, nom, sg.’ and *wór* /vur/ ‘sack, nom, sg.’ have /ɔ/. On the other hand *kółek* /kuwɛk/ ‘wheel, dim. gen, pl. non-masc.’ and *nózek* /nuʒɛk/ ‘leg, dim. gen, pl. non-masc.’ derived from *kóło* /kɔwɔ/ ‘wheel, nom,sg. neu.’ and *noga* /nɔga/ ‘leg, nom,sg. fem.’ have /u/. The adjectives that modify [+GF2] nouns in the plural do not undergo palatalizations and, unlike [–GF2] modifiers, realize the Nom. and Voc. plural as *e*. [+GF3] nominals show syncretism in the Nom. and Acc. singular and plural.

Whereas the case and gender decomposition are well-established in morpho-syntactic literature, the same cannot be said about the decomposition of declension class categories. Analyses utilizing class decompositions have been proposed in Müller (2004) for Russian and Alexiadou and Müller (2008) for Greek, German and Russian. The data in (28) show six declension classes of masculine personal nouns found in the singular. The cells containing the endings accompanied by palatalizations of the stems have been shaded.

(28)¹⁸

	Class I	Class II	Class III	Class IV	Class V	Class VI
Nom.	/ɸ/	/ɸ/	/ɸ/	/ɸ/	/in/-/ɸ/	/a/
Gen.	/a/	/a/	/a/	/a/	/in/-/a/	/i~i/
Dat.	/ɔvʲi/	/ɔvʲi/	/ɔvʲi/	/u/	/in/-/ɔvʲi/	/ɛ/,/i~i/
Acc.	/a/	/a/	/a/	/a/	/in/-/a/	/ɛw̃/
Loc.	/ɛ/	/u/	/u/	/u/	/in/-/ɛ/	/ɛ/,/i~i/
Inst.	/ɛm/	/ɛm/	/ɛm/	/ɛm/	/in/-/ɛm/	/ɔw̃/
Voc.	/ɛ/	/u/	/ɛ/	/ɛ/	/in/-/ɛ/	/ɔ/

Class I nouns show I-Anterior Palatalization in the Loc(ative) and Vocative which are realized as *e* /ɛ/. Class II nouns realize the Loc. and Voc. as *u* /u/ with no palatalization. Class III contains nouns in which *n*-head is realized as

¹⁸ Examples (all Nominative singular): class I: *premier* ‘prime minister’, *mer* ‘mayor’; class II: *drań* ‘scumbag’, *kibic* ‘supporter’, *mnich* ‘monk’, *syn* ‘son’; class III: *glupiec* ‘fool’; class IV: *Bóg* ‘god’, *pan* ‘gentleman’; class V: *sanoczanin* ‘inhabitant of Sanok’, *franciszkanin* ‘Franciscan’; class VI: *poeta* ‘poet’, *mówca* ‘speaker’.

(e)c / (ε)ts/. They differ from Class IV nouns in that the latter realize the Dat. as *u* /u/. Both Class III and IV show palatalizations in the Vocative. Class V is a productive class of demonyms characterized by the presence on the exponent *in* /in/ between the stem and inflectional desinences. The said morph *in* /in/ undergoes palatalization in the Loc. and Voc. Class VI contains many feminine and masculine-personal nouns. The nouns which undergo I-Anterior and the 2nd Velar Palatalizations take *e* /ε/ as the marker of the Dat. and Loc. Otherwise the Dat. and Loc. ending is *i*/y /i~i/. The declension classes attested in the plural are summarized in (29).

(29)¹⁹

	Class VII	Class VIII	Class IX	Class X	Class XI	Class XII
Nom.	/i~i/	/ɔvʲε/	/ε/	/ε/	/ε/	/a/
Gen.	/uf/	/uf/	/i~i/	/uf/	/φ/	/i~i/
Dat.	/ɔm/	/ɔm/	/ɔm/	/ɔm/	/ɔm/	/ɔm/
Acc.	/uf/	/uf/	/i~i/	/uf/	/φ/	/i~i/
Loc.	/ax/	/ax/	/ax/	/ax/	/ax/	/ax/
Inst.	/amʲi/	/amʲi/	/amʲi/	/amʲi/	/amʲi/	/(a)mʲi/
Voc.	/i~i/	/ɔvʲε/	/ε/	/ε/	/ε/	/a/

Class VII is characterized by I-Anterior, the 2nd Velar and Spirant Palatalizations in the Nom. and Voc., which are realized as *i~y* /i~i/. Class VIII does not show palatalizations and the Nom. and Voc. of this class are realized as *owie* /ɔvʲε/. Classes IX, X and XI are different from other classes in that they mark the Nom. and Voc. as *e* /ε/ and from each other in the realization of the Gen. and Acc. The nouns in classes X and XI undergo I-Anterior Palatalization in the Nom. and Voc. Class XII is a small class containing the nouns *bracia* 'brothers', *księża* 'priests'.

The following tables show the feature decomposition of declension classes of Polish virile nouns.

(30) Class decomposition of virile nouns in the singular (a) and plural (b)

(a)

	I	II	III	IV	V	VI
α	–	–	–	–	+	–
β	–	+	–	+	+	–

¹⁹ Examples (all Nominative plural): class VII: *premierzy* 'prime ministers', *mnisi* 'monks', *głupcy* 'fools', *poeci* 'poets'; class VIII: *merowie* 'mayors', *bogowie* 'gods', *panowie* 'gentlemen'; class IX: *dranie* 'scumbags'; class X: *kibice* 'supporters', *franciszkanie* 'Franciscans'; class XI: *sanocznianie* 'inhabitants of Sanok'; class XII: *bracia* 'brothers' and *księża* 'priests'. The data have been taken mainly from Orzechowska (1998).

γ	+	+	–	–	+	–
δ	–	+	+	+	–	–

b)

	VII	VIII	IX	X	XI	XII
α	+	+	–	–	+	–
β	–	+	–	–	–	+
γ	–	–	+	+	+	–
δ	+	–	–	+	+	–

Following Müller (2004) and Alexiadou and Müller (2008) I claim that the sets of desinences associated with particular classes are not predictable from the semantic or phonological properties of these classes. One of the consequences of this assumption is that, unlike gender and case features, class features cannot be provided with systematic definitions. Their nature is that of arbitrary labels: α, β, γ and δ. Class features do not play a role in the syntax and are not relevant for the semantic interpretation of nouns. Hence, they will be assumed to be added to the representations post-syntactically, along with case features.²⁰

²⁰ The approach postulated here denies the inherent lexical nature of the class identity of stems. If stems were marked for class lexically in Polish, as it is assumed for example in Alexiadou and Müller (2008) for German, Russian and Greek, then Polish nominals should be unambiguous as to their class identity or the cases of ambiguous class identity should be marginal or apparent, i.e. accompanied by regular semantic shifts. This view cannot be correct. In fact Polish nominals are notorious for their ambiguous behavior with respect to which declension class they belong to. This is evidenced by different declension groupings in the singular and in the plural. To adduce just a few examples, Class I nouns, when in the plural, can be declined according to Class VII (e.g. *premierzy* ‘prime minister, nom/voc, pl.’) or Class VIII (*merowie* ‘mayor, nom/voc, pl.’). The plurals of Class II nouns may decline according to Class VII (*Polacy* ‘Pole, nom/voc, pl.’), Class VIII (*magowie* ‘wizard, nom/voc, pl.’), Class IX (*gracze* ‘player, nom/voc, pl.’) or Class X (*karierowicze* ‘careerist, nom/voc, pl.’), in which one also finds many nouns from Class V. In addition to that a substantive number of nouns can be declined in a more than one way even for one and the same speaker. Thus, Class VII *muszkieterzy* exists aside Class VIII *muszkieterowie* ‘musketeer, nom/voc, pl.’ and *gamoni* is as acceptable as *gamoniów* ‘halfwit, gen/acc, pl.’, where the former declines according to Class IX, while the latter follows Class X.

The facts brought up above constitute strong arguments against the one-stem-one-class behavior of Polish nominals: the behavior predicted if declension classes are treated as lexical properties of stems. If, on the other hand, class features are added to morphological representation post-syntactically, one predicts considerably more freedom as to the set of class features that a single stem may carry. In particular, class feature values are predicted to be dependent on the conjunction of syntactic properties such as number, gender and the idiosyncratic properties of the stem. Furthermore, class identity is predicted not to be derivable from the values of case features and the phonological properties of the stems. In other words, by claiming that class features are augmented to the stems in the course of morphological computation, one opens the door for constrained variation as to the class identity of the stems. No such variation is predicted if class identity is defined lexically once and for all.

4.4. The exponence of Polish masculine-personal nouns

What follows is the analysis of the realization of *Exp*-nodes in Polish virile nouns. The analysis subsumes three components: the Impoverishment rules affecting *Exp*-nodes in some sets of declension classes, the vocabulary items resulting in palatalizations discussed in section 3, and the vocabulary items realizing *Exp*-nodes.

The two Impoverishment statements affecting Polish virile declensions are presented in (31).

(31) Impoverishment rules in masculinepersonal nouns

- (a) $[+PI] \rightarrow \emptyset / [-OBJ, +SUB, -GF2, +\gamma, _]$
 (b) $[+OBJ] \rightarrow \emptyset / [-OBL, +PRED, +Pl, -GF2, -\alpha, -\delta, _]$

The role of Impoverishment statements is to underline and account for exceptional properties of some sets of declension classes. Rule (31a) results in Classes IX, X and XI receiving the default exponent *e* /*ε*/ in the Nom. and Voc, while rule (31b) blocks the insertion of the general exponent of the Gen. and Acc. *ów* /*uf*/ in Classes IX and XII. (32) through (36) present the set of vocabulary items that result in palatalizations of the stems they anchor onto.

(32) The vocabulary items resulting in I-Anterior Palatalization

$$\begin{array}{c} \text{I} \\ \diagup \quad \diagdown \\ \quad \emptyset \end{array} \leftrightarrow \left\{ \begin{array}{l} \text{(a) } [+OBL, -PRED, -Pl, +\gamma, -\delta] \\ \text{(b) } [+SUB, -PRED, -\beta, +\delta] \\ \text{(c) } [+OBL, +SUB, -PRED, -Pl, -\gamma, +\delta] \\ \text{(d) } [-SUB, -PRED, -Pl, -\gamma, -\delta] \end{array} \right\} / \begin{array}{c} \text{CV}_{\text{FEN}} \\ | \\ \text{R} \end{array}$$

(32a) is the context in which I-head is added to Class I and V stems in the Loc. and Voc. singular. (32b) results in the I-Anterior Palatalization in the Nom. and Voc. of Classes VII, X and XI. (32c) results in the anchoring of I-head onto the stem *pan* /*pan*/ ‘mister, nom, sg.’ in the Voc. singular. Finally, (32d) is responsible for the I-Anterior Palatalization observed in the Dat. and Loc. of class VI.

(33) The vocabulary items resulting in the 2nd Velar Palatalization

$$\begin{array}{c} \text{A} \\ \diagup \quad \diagdown \\ \quad \text{I} \end{array} \leftrightarrow \left\{ \begin{array}{l} \text{(a) } [-OBJ, +SUB, +\alpha, -\beta, -GF2] \\ \text{(b) } [-SUB, -PRED, -Pl, -\gamma, -\delta] \end{array} \right\} / \begin{array}{c} \text{CV}_{\text{FEN}} \\ | \\ \emptyset \end{array}$$

The features mentioned in (33a) make sure that the [PLACE[A.I]] anchors onto stems in the Nom. and Voc. of Classes VII. (33b) results in the 2nd Velar Palatalization in Class VI in the Dat. and Loc.

(34) The vocabulary item resulting in Spirant Palatalization

$$\begin{array}{ccc} \text{I} & & \text{CV}_{\text{FEN}} \\ & \diagdown & \\ & \emptyset & \leftrightarrow [-\text{PRED}, -\gamma, +\delta] / \quad | \\ & & \{ \text{A.I.h.}(\text{H}) \} \end{array}$$

(34) results in the application of Spirant Palatalization in the Nom. and Voc. Class VII. As I have mentioned above, Spirant Palatalization is extremely restricted in its application. In fact in virile nouns it applies only to the outputs of the 2nd Velar Palatalization in the Nom. and Voc. plural of the nouns *Wołoch* ‘Vlach, nom, sg’, *Czech* ‘Czech, nom, sg’, *mnich* ‘monk, nom, sg.’ and *Włoch* ‘Italian, nom, sg.’

(35) The vocabulary item resulting in the 1st Velar Palatalization

$$\begin{array}{ccc} \text{A} & & \text{CV}_{\text{FEN}} \\ & \diagdown & \\ & \text{I} & \leftrightarrow [+ \text{OBL}, + \text{SUB}, - \text{PRED}, - \text{Pl}, - \gamma, + \delta] / \quad | \\ & & \emptyset \end{array}$$

Although the 1st Velar Palatalization is one of the most productive and best attested changes in Polish, in the inflectional system it applies only in the Voc. singular of the Class IV noun *Bóg* /bug/ ‘god, nom, sg.’

(36) The vocabulary item resulting in Affricate Palatalization

$$\begin{array}{ccc} \emptyset & & \text{CV}_{\text{FEN}} \\ & \diagdown & \\ & \text{A} & \leftrightarrow [+ \text{OBL}, + \text{SUB}, - \text{PRED}, - \text{Pl}, - \gamma, + \delta] / \quad | \\ & & \{ \underline{\text{A.I.}}.(\text{H}) \} \end{array}$$

The vocabulary item in (36) is responsible for the augmentation of A to stem-final dental affricates in the Voc. of Classes III and IV. Affricate Palatalization is attested in all Class III nouns and in a Class IV noun *ksiądz* /kɕɔndz/ ‘priest, nom, sg.’

The phonological parts of the vocabulary items presented above are defective pieces of autosegmental representation. Consequently, they cannot be realized on their own and must anchor onto the stem-final consonants causing palatalizations. The combinations of features to which the palatalizing agents are related are rewritten on Vocabulary Insertion as argued for by Bobaljik (2000). The crucial consequence of this is that these features sets must not be referred to for the purposes of the realization of the *Exp*-nodes. Faced with a massive disappearance of features correlated with palatalization phenomena, one is inclined to make a prediction that the Vocabulary Items which realize the relevant *Exp*-nodes will be default items. The analysis of the exponence of Polish virile nouns presented in (37) demonstrates that the claim whereby palatalizations are accompanied by default exponence is possible to substantiate. The major part of the vocabulary presented in points (33)–(36) is in fact followed by the insertion of the default ending *e* /ɛ/ into what is left of the original *Exp*-nodes. The only exception are items (32b), (33a) and (34) responsible for the application of the I-Anterior, 2nd Velar and Spirant Palatalizations in the Nom. and Voc. Class VII.

In this case, the exponent realizing the remaining features in the *Exp*-node is *i/y* /*i~i*/, which, as a matter of fact, is the default for plural nouns.

(37) The realizations of the *Exp*-nodes in masculine personal nouns

$\left\{ \begin{array}{l} [-\text{OBL}, +\text{SUB}, -\text{PRED}, -\text{Pl}] \\ [-\text{OBL}, +\text{OBJ}, +\text{PRED}, +\text{Pl}, +\alpha, +\gamma] \end{array} \right\} \leftrightarrow / \phi /$	$\left\{ \begin{array}{l} [-\text{OBL}, +\text{OBJ}, -\text{PRED}, +\text{Pl}] \leftrightarrow / \phi \text{m} / \\ [+ \text{OBL}, -\text{OBJ}, -\text{SUB}, +\text{Pl}] \leftrightarrow / \text{ax} / \\ [+ \text{OBL}, +\text{OBJ}, -\text{SUB}, +\text{PRED}, +\text{Pl}] \leftrightarrow / \text{am}^i \text{i} / \end{array} \right.$
$\left\{ \begin{array}{l} [-\text{OBL}, +\text{OBJ}, +\text{PRED}] \\ [-\text{OBJ}, +\text{SUB}, +\text{Pl}, -\alpha, -\beta] \\ [-\text{OBL}, +\text{SUB}, -\text{PRED}, -\text{Pl}, -\gamma, -\delta] \end{array} \right\} \leftrightarrow / \text{a} /$	$\left\{ \begin{array}{l} [-\text{OBJ}, +\text{SUB}, +\text{Pl}, +\alpha, -\delta] \leftrightarrow / \phi \text{v}^i \text{e} / \\ [-\text{OBL}, +\text{OBJ}, -\text{SUB}, +\text{PRED}, -\text{Pl}, -\gamma, -\delta] \leftrightarrow / \epsilon \tilde{\text{w}} / \\ [+ \text{OBL}, +\text{PRED}, -\text{Pl}, -\gamma, -\delta] \leftrightarrow / \phi \tilde{\text{w}} / \\ [+ \text{OBL}, +\text{SUB}, -\text{PRED}, -\text{Pl}, -\gamma, -\delta] \leftrightarrow / \phi / \end{array} \right.$
$[-\text{SUB}, -\text{PRED}, -\text{Pl}] \leftrightarrow / \phi \text{v}^i \text{i} /$	
$\left\{ \begin{array}{l} [+ \text{OBL}, -\text{SUB}, -\text{PRED}, -\text{Pl}, +\delta] \\ [-\text{OBL}, -\text{SUB}, -\text{PRED}, -\text{Pl}, -\alpha, +\beta, -\gamma] \\ [+ \text{OBL}, +\text{SUB}, -\text{PRED}, -\text{Pl}, +\delta] \end{array} \right\} \leftrightarrow / \text{u} /$	$\left\{ \begin{array}{l} [+ \text{Pl}] \\ [-\text{OBL}, +\text{OBJ}, +\text{PRED}, -\text{Pl}, -\gamma, -\delta] \\ [-\text{SUB}, -\text{PRED}, -\text{Pl}, -\gamma, -\delta] \end{array} \right\} \leftrightarrow / i \sim i /$
$[+ \text{OBL}, +\text{PRED}, -\text{Pl}] \leftrightarrow / \epsilon \text{m} /$	$\text{ExpI}[+\alpha] \leftrightarrow / \text{in} /$
$[-\text{OBL}, +\text{OBJ}, +\text{PRED}, +\text{Pl}] \leftrightarrow / \text{uf} /$	
$\text{elsewhere} \leftrightarrow / \epsilon /$	

To conclude this section let us exemplify how the interaction between Fusion, palatalizations and exponence is worked out. Let us take a closer look at the derivation of the Vocative singular of a Class V demonym *sanoczanin* /*sanotʃain*/ ‘the inhabitant of Sanok, nom, sg.’

We have to keep in mind that Class V nouns have a complex morphotactic representation. A root, which is a placename is merged with *n*-head realized as *an* /*an*/. Between the *an*-head and the inflectional endings, one finds an *in* /*in*/ exponent. *in* /*in*/ is characteristic of Class V in that it does not surface in the plural of the relevant demonyms and is not found in any other declension class.

In order to account for the unusual morphotactics of Class V, let us assume a condition peculiar to that class: Class V blocking:

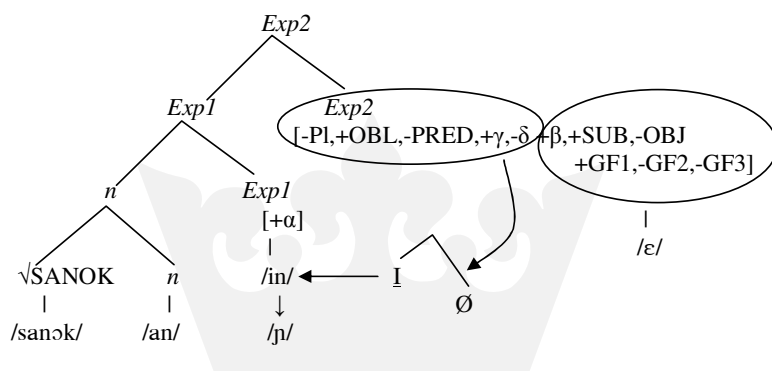
(38) Class V blocking

$$*[\alpha, -\text{Pl}]$$

The structural description of Class V blocking states that feature $[\alpha]$ must not be found under one and the same node as feature $[-\text{Pl}]$. The result is the

presence of two *Exp*-nodes which undergo Vocabulary Insertion separately. Consider representation (39).

- (39) The Vocabulary Insertion of the of *sanoczanie* /sanɔtʃanipɛ/²¹ ‘the inhabitant of Sanok, voc, sg.’
sg.



As soon as *Exp1* undergoes VI, the long-term memory is scanned for vocabulary items that could realize the features on *Exp2*. Since vocabulary item (32a) wins the competition, I-head is inserted and the features with which it is related, i.e. [+OBL, -PRED, -Pl, +γ, -δ] are rewritten. However, I-head, being subsegmental, cannot realize *Exp2*. In order to satisfy REALIZE MORPHEME, in course of phonological computation the element is integrated into the representation of the closest, i.e. stem-final, consonant /n/ – {A.?.L}, deriving /ɲ/ – {A.I.?.L}. Since no exponent matches the remaining specification of *Exp2*, the default is inserted.

Having established a plausible picture of the introduction of floating palatalizing agents into phonological representations, let us have a closer look at the empirical consequences of the analysis outlined in this section.

5. The Dative and Locative of Class VI

The idea that palatalizations are the effect of the anchoring of subsegmental structure inserted only in some morphologically-defined environments may or may not seem appealing to the reader depending on their general theoretical background and inclinations. In order for the Generalized Nonlinear Affixation analysis to be more than just a novel way of looking at palatalizations, it is necessary to indicate some empirical areas in which it makes different

²¹ The 1st Velar Palatalization observed in the exponent of the root and the I-Anterior Palatalization affecting the *an*-head always accompany the formation of demonyms derived from Polish placenames. They are of no interest to us for the purposes of the current analysis.

predictions from the approaches assuming that palatalizations are triggered by desinences. Furthermore, it is vital to show that the predictions made by the Generalized Nonlinear Affixation are substantiated, while the alternative analyses stumble. It is the aim of this section to show that the approach put forward here is, indeed, empirically superior.

Table (40) illustrates the distribution of the desinences of the Dative and Locative singular Class VI feminine nouns.

(40) The exponents of the Dative and Locative singular feminine nouns (Class VI):

a.			b.		
Dat. and Loc. in <i>e</i> / <i>ε</i> /		Glosses	Dat. and Loc. in <i>i/y</i> / <i>i~i</i> /		Glosses
Nominative	Dat./Loc.		Nominative	Dat./Loc.	
<i>baba</i> /baba/	<i>babie</i> /babʲe/	‘woman’	<i>stulbia</i> /stuwɓʲa/	<i>stulbi</i> /stuwɓi/	‘hydra’
<i>mapa</i> /mapa/	<i>mapie</i> /mapʲe/	‘map’	<i>kopia</i> /kɔpʲa/	<i>kopii</i> /kɔpʲi/	‘copy’
<i>lava</i> /lava/	<i>lawie</i> /lavʲe/	‘lava’	<i>rewia</i> /rɛvʲa/	<i>rewii</i> /rɛvʲi/	‘revue’
<i>szafa</i> /ʃafa/	<i>szafie</i> /ʃafʲe/	‘wardrobe’	<i>biografia</i> /bʲɔɡrafʲa/	<i>biografi</i> /bʲɔɡrafʲi/	‘biography’
<i>koza</i> /kɔza/	<i>kozie</i> /kɔzʲe/	‘nanny-goat’	<i>buzia</i> /buza/	<i>buzi</i> /buzi/	‘face’
<i>kosa</i> /kɔsa/	<i>kosie</i> /kɔcʲe/	‘scythe’	<i>Kasia</i> /kaca/	<i>Kasi</i> /kaci/	‘Kate’
<i>buda</i> /buda/	<i>budzie</i> /budʲzʲe/	‘kennel’	<i>dzidzia</i> /dziɖʲza/	<i>dzidzi</i> /ɖʲziɖʲzi/	‘tot’
<i>grota</i> /grɔta/	<i>grocie</i> /grɔcʲe/	‘cave’	<i>babcia</i> /baptʲca/	<i>babci</i> /baptʲci/	‘grandma’
<i>kura</i> /kura/	<i>kurze</i> /kuʒʲe/	‘hen’	<i>burza</i> /buʒa/	<i>burzy</i> /buʒi/	‘storm’
<i>stula</i> /stuwa/	<i>stule</i> /stule/	‘stole’	<i>kula</i> /kula/	<i>kuli</i> /kuli/	‘sphere’
<i>mama</i> /mama/	<i>mamie</i> /mamʲe/	‘mom’	<i>ziemia</i> /zemʲa/	<i>ziemi</i> /zemʲi/	‘earth’
<i>strona</i> /strɔna/	<i>stronie</i> /strɔɲʲe/	‘side’	<i>niania</i> /ɲapa/	<i>niani</i> /ɲapi/	‘nanny’
<i>foka</i> /fɔka/	<i>focie</i> /fɔʃʲe/	‘true seal’	<i>praca</i> /praʦa/	<i>pracy</i> /praʦʲi/	‘work’
<i>mucha</i> /muxa/	<i>musze</i> /muʃʲe/	‘fly’	<i>kasza</i> /kaʃa/	<i>kaszy</i> /kaʃʲi/	‘groats’
<i>noga</i> /nɔga/	<i>nodze</i> /nɔɖʲzʲe/	‘leg’	<i>sadza</i> /sadʒa/	<i>sadzy</i> /sadʒʲi/	‘soot’

The items in part (a) of the table show the effects of the I-Anterior and 2nd Velar Palatalizations. Whenever the palatalizations apply the Dat. and Loc. are realized as *e* /*ε*/. The words presented in part (b) do not undergo palatalizations: in those words stem-final palatal consonants are part of the underlying representations. This is justified by the fact that the items in part (b) surface with soft stem-final consonants also in the Nominative, which, as indicated by the words in the left-most column of the table, does not induce palatalizations. In sum the words presented in part (b) of the table surface with soft or palatal stem-final consonants throughout their paradigms, whereas the items in part (a) show palatalizations in the Dat. and Loc. The exponent of the Dat. and Loc. of the soft-stemmed items is *i/y* /*i~i*/.

The established analysis of the distribution of the Dat. and Loc. endings in Class VI nouns crucially refers to the mechanism of phonologically-driven allomorphy and the distinction between soft and hard stems in Polish.

Gussmann (2007: 106–107) analyses the distribution as depending on the presence of element I in the stem-final consonant. If the consonant terminating a stem possesses an I-head or I-operator in its elemental make-up, *i/y /i~i/* is selected. Otherwise, the ending is *e /ε/*. Under this account the palatalizations observed in (40a) must crucially follow the selection of the desinence. If that were not the case, *i/y /i~i/* would be selected also for the items with underlying hard (I-less) stems. Gussmann is explicit on the ordering between allomorph selection and palatalizations. He claims that ‘It thus seems inevitable that a precedence or ordering relation should be introduced between allomorphy selection and morphophonological adjustment’ (2007: 107).

The analysis presented in section 4, suggests an alternative whereby palatalizations are the effect of rewriting of the matching features by a subsegmental structure. As it is the case in Gussmann’s analysis *e /ε/* is the default exponent. The crucial difference between the analysis proposed here and Gussmann’s analysis, is that here the insertion of *i/y /i~i/* does not depend on the phonology of the stem but rather on the non-application of palatalizations. *i/y /i~i/* is specified morpho-syntactically for insertion in the Dat. and Loc. Class VI. If the features are matched and rewritten, *i/y /i~i/* must not be inserted. At first sight the two analysis are equally valid, except perhaps that the phonologically-driven allomorphy analysis captures the generalization that *i/y /i~i/* is attached to I-stems. For the Generalized Nonlinear Affixation alternative, this is an accident. Importantly, the generalization is only apparent. Consider the data presented in (41).

(41)

Nominative sg.	Dative/Locative sg.	Glosses
<i>Mant/u/-/a/</i>	<i>Mant/u/-/i/ *Mant/u/-/ε/</i>	‘Mantua’
<i>Kap/u/-/a/</i>	<i>Kap/u/-/i/ *Kap/u/-/ε/</i>	‘Capua’
<i>Gen/u/-/a/</i>	<i>Gen/u/-/i/ *Gen/u/-/ε/</i>	‘Genova’
<i>Mess/u/-/a/</i>	<i>Mess/u/-/i/ *Mess/u/-/ε/</i>	‘name’
<i>Mel/u/-/a/</i>	<i>Mel/u/-/i/ *Mel/u/-/ε/</i>	‘surname’
<i>stat/u/-/a/</i>	<i>stat/u/-/i/ *stat/u/-/ε/</i> ²²	‘statue’
<i>st/ɔ/-/a/</i>	<i>st/ɔ/-/i/ *st/ɔ/-/ε/</i>	‘stoa’
<i>Arbel/ɔ/-/a/</i>	<i>Arbel/ɔ/-/i/ *Arbel/ɔ/-/ε/</i>	‘surname’
<i>Figuerr/ɔ/-/a/</i>	<i>Figuerr/ɔ/-/i/ *Figuerr/ɔ/-/ε/</i>	‘surname’

The table in (41) contains a set of words of foreign origin functioning in Polish. Interestingly for the two approaches to the distribution of the exponents of

²² For many speakers the common nouns *statua* ‘statue, nom, sg, fem.’ and *stoa* ‘stoa, nom, sg, fem.’ have been reanalyzed as terminating in /w/. As a result, they undergo regular I-Anterior Palatalization giving *statule* /statule/ ‘statue, dat/loc, sg, fem.’ and *stole* /stole/ ‘stoa, dat/loc, sg, fem.’ These forms are deemed incorrect by the prescriptive sources.

the Dat. and Loc., the stem-final segments of these items are not consonants. Moreover, being back vowels they do not contain element I.

Since, according to Gussmann (2007), the environment for the selection of *i/y /i~i/* is restricted to stems terminating in segments containing I-element, the items in (41) should realize the Dative and Locative as *e /ε/*. This is, crucially, not the case. The only grammatical Dat/Loc. desinence is *i/y /i~i/*. Quite visibly, the phonologically-driven allomorphy account fails to predict the correct selection of the Dat/Loc. ending of the Class VI nouns presented in (41).

On the other hand, the Generalized Nonlinear Affixation approach predicts that *e /ε/* surfaces as the Dat/Loc. Class VI ending only if the preceding consonant undergoes palatalization. Consider the four vocabulary items which compete for insertion in the relevant context with a hypothetical stem terminating in a velar.

- (42)
- | | | | | |
|-----|---|---|---|---|
| (a) | $\begin{array}{c} \diagup \\ \text{A} \\ \diagdown \\ \text{I} \end{array}$ | ↔ | $[-\text{SUB}, -\text{PRED}, -\text{PL}, -\gamma, -\delta] /$ | $\begin{array}{c} \text{CV}_{\text{FEN}} \\ \\ \emptyset \end{array}$ |
| (b) | $\begin{array}{c} \diagup \\ \text{I} \\ \diagdown \\ \emptyset \end{array}$ | ↔ | $[-\text{SUB}, -\text{PRED}, -\text{PL}, -\gamma, -\delta] /$ | $\begin{array}{c} \text{CV}_{\text{FEN}} \\ \\ \text{R} \end{array}$ |
| (c) | $[-\text{SUB}, -\text{PRED}, -\text{PL}, -\gamma, -\delta] \leftrightarrow /i\sim i/$ | | | |
| (d) | $[-\text{SUB}, -\text{PRED}, -\text{PL}] \leftrightarrow /ɔvʲi/$ | | | |

The most general vocabulary item (42d) loses the competition to class-specific (42a), (42b) and (42c). The three are specified for the same set of formal features. Still, (42a) wins the competition as (42b) does not match the environment and (42c) is non-contextual. Once (42a) is selected, the features it matched are rewritten. Still, the autosegment [PLACE[A,I]] is not suitable or, literally, not big-enough to realize the node that matches its grammatical features. Instead it anchors onto the stem-final velar resulting in the 2nd Velar Palatalization. The *Exp*-node is realized by the default *e /ε/*. If the stem does not terminate in a velar, i.e. a segment with an empty place node, but for example, in a dental stop, then (42b) wins the competition. The consequences for exponence are the same as in the case of the item (42a).

If the stem-final segment is neither a velar nor a dental stop, (42c) must be selected. As the phonological part of vocabulary item (42c) is a well-formed phonological expression {I}, it realizes not only the features it matches but the entire *Exp*-node. This is exactly the case in the items presented in (41).

6. Conclusion

The aim of the paper was to put-forward a unified account of Polish palatalizations and exponence. In section 3 I focused on the structural changes of the palatalizations and showed that they can be expressed as anchoring of autosegments onto the stem-final input segments. In section 4 an analysis of the palatalizations and exponence of Polish masculine-personal declensions has been provided. The exponents which surface in the contexts of palatalizations are predicted to be the default vocabulary items.

The challenge that awaits the framework outlined in the article is to account for the interaction between palatalization phenomena and the exponence in other areas of the morpho-phonology of Polish. In particular, it is necessary to investigate how the account presented above fares when confronted with palatalizations attested in the derivational morphology of Polish (e.g. expressive palatalizations) and in Polish verbal system (e.g. J-Palatalization). As pointed out by one of the reviewers, especially the former task seems particularly formidable. This is the case due to the richness of derivational affixes in Polish. Let me only note that the palatalizations accompanying some of the derivational affixes will have to be analysed as an integration of autosegments which constitute parts of the lexical representation of the relevant affixes. A similar analysis has been postulated by Lieber (1987) to account for mutations attested in a Western Nilotic language Nuer (see also Wolf 2005).

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Katedra Fonologii i Fonetyki
Instytut Filologii Angielskiej
Katolicki Uniwersytet Lubelski Jana Pawła II
Al. Raławickie 14
20-950 Lublin
Poland
[s.zdziebko86@gmail.com]